

**(REVISED SEPTEMBER 1999)**

## **UNITED STATES GREENHOUSE GAS INVENTORY (GHG)**

### **Methodology**

Figures 29 through 32 present carbon dioxide emissions data by industry sector for the entire US in the year 1994. This analysis was based on data contained in several Environmental Protection Agency (EPA) and Energy Information Administration (EIA) reports, as well as a report from the Department of Agriculture (USDA): the Manufacturing Consumption of Energy 1994, DOE/EIA-0512(94); The Annual Energy Review 1997, DOE/EIA-0384(97); Emissions of Greenhouse Gases in the United States 1997, DOE/EIA-0573(97); the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1997, EPA 236-R-99-003; and Economic Analysis of US Agriculture and the Kyoto Protocol, May 1999.

The Annual Energy Review and the Inventory of US Greenhouse Gas Emissions and Sinks were used to develop national estimates of CO<sub>2</sub> for the year 1994. Both of these inventories report data on CO<sub>2</sub> emissions caused by both fuel combustion and industrial processes, and both were included in this analysis. Typically, fossil fuel combustion represents 81% of total US GHG emissions and 99% of total US CO<sub>2</sub> emissions, although there is some year-to-year variance. Cement manufacture is the largest remaining source of industrial CO<sub>2</sub> emissions, and has been estimated to contribute about 10 million metric tons of carbon equivalents (MMTCE) to annual US emissions. For more information on industrial sources of CO<sub>2</sub> or other GHG emission data, the reader is referred to the online version of the EPA inventory document at [www.epa.gov/globalwarming/inventory](http://www.epa.gov/globalwarming/inventory).

The Manufacturing Consumption of Energy (known as MECS) data were used to develop the detailed estimates for the industry sector. The MECS data are prepared once every 4 years, thus 1994 is presented as the most recent year for which the MECS data were available. The MECS data contains rich detail on energy use at manufacturing industries, but no information on the non-manufacturing industries, such as agricultural activity, mining, and construction. The MECS data were merged with estimates of total industrial energy use to develop these results. Emission estimates were developed using carbon coefficients for various fuel types, and for a quality assurance check, were compared with national inventory data. Refer to Annex A of the EPA Inventory document for more detail on carbon coefficients for fuel types. The table below presents the actual carbon coefficients used in this analysis.

**CARBON COEFFICIENTS, MMTCE/QBtu(Q=E15)**

	Electricity	Resid Oil	Dist. Oil	NG	LPG	Coal	Coke
1994	50	21.49	19.95	14	17.01	25	25
1996	50	21.49	19.95	14	16.99	25	25

Because the MECS data didn't offer information on the non-manufacturing sectors of industrial CO<sub>2</sub> emissions, USDA's Economic Analysis of US Agriculture and the Kyoto Protocol was used to map in the agricultural sector's contribution to the emissions. This was achieved by converting the energy use data as presented in the USDA document (in the forms of petroleum and electricity) into correlating emissions. The breakout of the non-manufacturing data is reflected in figures 30 through 32.

Figures 29 through 32 present total national CO<sub>2</sub> emissions for the U.S., broken out by sector. The utility sector, which represents 36% of total CO<sub>2</sub> emissions in 1994, supplies energy to industry, residential, and commercial sectors. Emissions resulting from electricity production can thus be prorated to industry on the basis of electricity consumption. Ideally, this would be done on a regional basis in order to best capture the complexity of our nation's energy supply system and to account for variations in carbon emissions per kilowatt hour. However, this analysis uses national averages to develop the carbon emissions embedded in electricity

consumption and attributes these emissions to the industries on the basis of their electricity demand.

## **Results**

Figure 29 presents total CO<sub>2</sub> emissions for the entire US; emissions from the utility sector have been "mapped" into the various end-use sectors that consume the electricity generated at utilities.

Figure 30 shows total US CO<sub>2</sub> emissions in 1994. Utilities contribute 36% of that total, with transportation the second largest sector at 30% of total CO<sub>2</sub> emissions. Emissions from utilities were estimated at 494 MMTCE in 1994, with 87% of that total resulting from coal consumption, 9% from natural gas, and 4% from petroleum fuels.

Figure 31 presents all industrial emissions of CO<sub>2</sub> - both manufacturing and non-manufacturing. The analysis was developed to account for both "on-site" and "off-site" emissions. In this case, on-site emissions are process-related emissions such as CO<sub>2</sub> flux from lime calcination, and off-site emissions refer to the emissions that result from fossil fuel consumption at power plants supplying electricity to industry.

Figure 32 presents the CO<sub>2</sub> emissions data in tabular form.